their eyes with bichloride solution just before an operation under local anesthesia unpleasant and would be detrimental to their subsequent behavior, this would not apply when a general anesthetic is used and I believe, from Major Smith's experience, that free douching is undoubtedly advantageous.

With the general anesthetic I also use cocaine and adrenalin solutions. Cocaine has a tendency to lower the tension of the eye. In the New York Eye Infirmary it was the custom to instill after the extraction a 10% solution of cocaine with that idea in view. The control of the eye under a general anesthetic is not difficult provided the anesthesia is profound. Regarding the sutures, I have had some experience with catgut in the conjunctiva that was not favorable. In the cases that I have done so far I have never had trouble with the silk sutures though the removal of sutures in cataract cases is a very delicate manipulation.

RADIOLOGICAL INVESTIGATION OF THE DISEASES OF THE STOMACH.*

By C. M. COOPER, M. B., and G. L. PAINTER, M. D., San Francisco.

The introduction into medicine of the bismuth test meal whether due to Rieder or Courmelles forms a landmark in the progress of the study of diseases of the stomach, the importance of which even to-day is recognized in only a few clinics.

The test meal may consist of boiled rice, potato puree, barley broth or minced meat according to the desires of the patient, the amount for an adult is 400 grammes by weight. Two ounces of bismuth subcarbonate or bismuth oxychloride are rubbed up into a thin paste with water or milk, and the food added little by little to the bismuth suspension with which it is well mixed. The meal can be flavored with sugar of milk or raspberry juice. It should be served warm.

In many instances the facilities for the preparation of such a meal are lacking. A pint of kefir or koumyss milk with which two ounces of the bismuth salt is well mixed forms an excellent substitute. As Pfahler has shown the bismuth salt remains well suspended. The quantity mentioned is sufficient to render visible every part of the normal stomach.

Though the bismuth meal may cause some distortion, and may perhaps interfere with the normal gastric physiology, thus giving no absolute values, yet if always of the same weight and viscosity, it yields results that are directly-uniformly comparable.

This meal like the Ewald test meal is best administered in the morning when the stomach is empty.

Two radiograms should be made, one immediately subsequent to the taking of the meal, the other four hours afterwards by which time this bismuth meal should have left the stomach. If preferred the double test meal method of Haudek may be employed, the second test meal being given six hours after the first. At the time of taking this second meal a part of the first should have reached the hepatic flexure.

Lead markers should be placed, one over the umbilicus, another over the sterno-xiphoid junction. The patient may be clad in a thin undervest, and since the main work of the stomach is done with the body in the upright posture the X-Ray investigation should be made with the body erect, the abdomen facing the plate.

The target of the X-Ray tube should be at a uniform distance (60 cm.) from the plate, and the incident perpendicular ray should pass through the lower marker.

The time of exposure depends upon the particular apparatus that is used to energize the tube, the more powerful the apparatus the shorter the exposure, and the cleaner cut the shadow images. However, excellent work can be done with the coils that have been in use for some years, especially with the aid of the newer intensifying screens.

The plates obtained must be satisfactory, i. e., the shadow of the bismuth meal should be quite white and plainly visible, the shadows of the markers should be clean cut. If the shadows be indefinite or blurred the work should be re-done.

Before attempting to interpret the plate the clinician must be familiar with the picture of the normal bismuth-containing stomach, which exhibits the following characteristics:

The shape of the shadow so obtained is best likened to that of a fish-hook or syphon, it presenting a descending, transverse and an ascending portion. Occupying the upper pole of the descending portion and therefore immediately under the inner part of the left diaphragm is the stomach air content, the so-called megenblase or stomach bubble, containing merely air it is highly transradiant. It is convex above and bounded below by a straight line which marks the upper boundary of the dense shadow thrown by the contained bismuth meal. The upper portion of this latter shadow is not uncommonly less dense than the main shadow, this lessened density being in some cases perhaps due to the collection of gastric secretion above the level of the test meal, and it has been suggested that the vertical extent of this intermediate zone may indicate in a rough way the secretory activity of the stomach. With the Koumyss meal the froth may exhibit a characteristic appearance above the level of the liquid.

The descending portion runs downwards and inwards slightly narrowing just below the stomach bubble, this narrowing having been termed by Rieder after His the *incisura cardiaca.* Again widening a little it journeys downwards and inwards and becomes continuous with the mesially placed transverse portion or stomach sac as this has been named by Grodel.

From the stomach sac the ascending portion runs upwards and slightly to the right, the shadow of the bismuth meal ending at the pylorus which is frequently represented by a shadow-free space of about a finger's breadth separating the shadow due to the gastric contents from the shadow due to a portion of the meal which has already found its way into the first part of the duodenum.

In the ascending portion near the stomach sac a slight constriction is not infrequently to be seen.

* Read before the Forty-Second Annual Meeting of the State Society, Del Monte, April, 1912

This represents the position of the sphincter antri, and the portion of the shadow between this constriction and the pyloric ring represents the contents of the antrum. The segment where the ascending and descending portion join is, according to this description, the stomach sac, and the angle of junction has been termed the stomach angle.

The fundus lies in contact with the inner two-thirds of the left diaphragmatic arch. The cardiac end of the stomach is on the right side of the body of the tenth or eleventh dorsal vertebra, it is the most fixed point of the stomach.

The descending portion of the stomach lies to the left of the vertebral column, its inner border lying close and almost parallel to it. The stomach sac is situated almost medially, exhibiting about its center the shadow of the marker placed on the umbilicus. Its lower border reaches as low as the disc between the third and fourth lumbar vertebrae.

The pyloric ring is situated on a level with the first or second lumbar vertebra laterally a little to the right of the middle line.

The size of the shadow. The test meal as advised fills the normal stomach to above the level of the incisura cardiaca, and the different parts of the shadow occupy the anatomical areas described. Commonly the descending portion is not over a hand's breadth in width, and the ascending portion three to four finger's breadth.

The contour of its border. This is normally regular and clean cut, there occurring no ragged margins, no steep and marked incurvations except at the sphincter antri and no cup-like depressions. The slight narrowing at the incisura cardiaca has been alluded to. Sometimes when the exposure is a very quick one the stomach shadow registers the peristaltic contraction, the outline of the greater curvature presenting a wave-like appearance. The angle where the descending portion of the lesser curvature becomes continuous with the ascending is normally a blunt one, and owing to the obliquity of the stomach the angle may sometimes appear sharp when really blunt.

The uniformity of the shadow. The density of the bismuth shadow below the level of the intermediate layer is uniform if the bismuth salt be thoroughly suspended in the mixture.

If instead of the usual bismuth test meal half or double the quantity be administered, the outline of the normal stomach maintains its fundamental form unchanged. The shadow obtained reaches to the same height as that thrown by the standard meal, its individual parts varying only in breadth. This is due to the so-called peristolic function which enables it to closely embrace its contents.

If the radiogram be made with the patient prone instead of erect, the form and position of the stomach shadow is markedly different from that described. The whole shadow is now well above the level of the umbilicus. It is somewhat horn-shaped in appearance, the pylorus now representing its most caudal point.

FLUOROSCOPY OF THE BISMUTH MEAL-CONTAINING STOMACH.

The shadow picture exhibited on the fluoroscope is, of course, an exact replica of that thrown on the plate, though the details of its outline are not so clearly seen. The use of the screen, however, enables us to recognize readily other features which are of considerable importance.

a. During respiration the gastric shadow is seen to move downwards as the diaphragm descends, upwards as it ascends. If during fluoroscopic inspection the patient be asked to contract his abdominal muscles thus drawing in the abdomen, or if the abdomen be pushed in the shadow is seen to be raised a hand's breadth, though the position of the pylorus is little changed.

b. If one pushes a finger into the shadow mass either at its margin or into its surface, one can displace the bismuth meal from the spot indented and a bright area becomes apparent.

c. If one watches closely one can see the characteristic gastric peristaltic waves. They begin in the descending limb of the stomach, are to be seen traveling along the curvatures and cease at the sphincter antri, there leading to the concentric constriction previously spoken of. Contractions of the antrum itself then occur. These continue till the antrum is emptied, the contents passing through the pylorus or back into the proximal part of the stomach. The antrum is again formed and the whole procedure recurs, one revolution occurring about every twenty-one seconds.

d. If one kneads the shadow mass against the vertebral column the peristaltic waves become more brisk, and the contents of the antrum are massaged on into the duodenum.

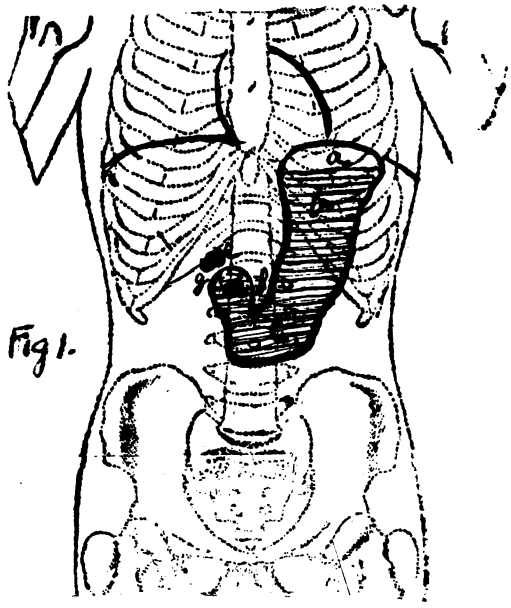
VARIATIONS IN GASTRIC TONICITY.

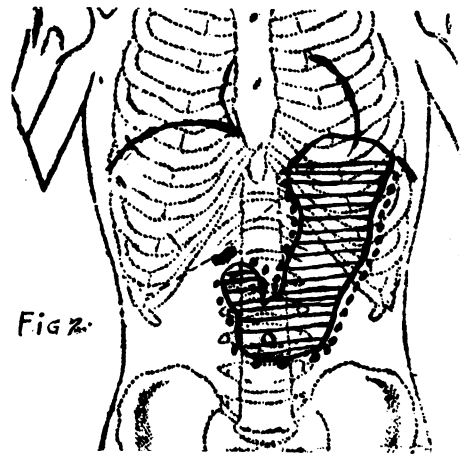
The form of the shadow which has been described as that of the normal, presupposes and is dependent upon, a normal tonicity of the gastric walls. But the gastric tonus may be of different degrees even in individuals who present no gastric symptoms. Thus, according to Schlesinger, we have the hypertonic stomach, the orthotonic stomach, the hypotonic stomach and the atonic stomach, either of which may exist with or without actual organic gastric disease.

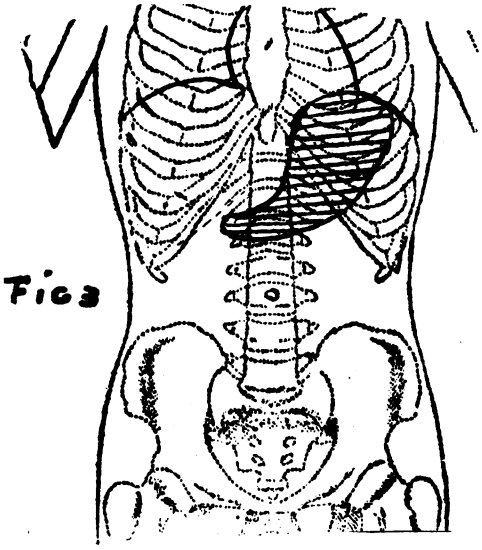
The shadow of the bismuth meal-containing hypertonic stomach as registered in the erect posture is shaped like a steer's horn, the pylorus representing its deepest point. The fish-hook form of stomach becomes, as we have already seen, somewhat like a steer's horn when the patient is prone. Holznecht firstly described this type and considers that in man as distinct from woman it represents the normal, but such a shape if obtained in the erect posture is significant of increased gastric tonicity; the emptying time of such a hypertonic stomach is from two to three hours.

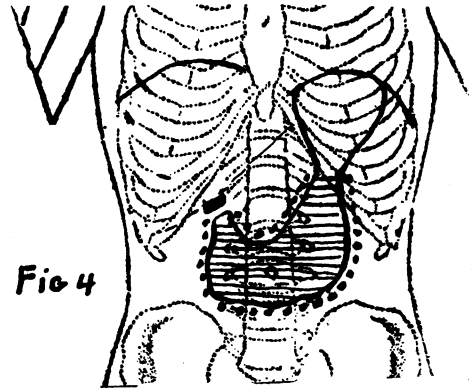
The characteristics of the shadow of the orthotonic stomach have been described in full.

The shadow of the hypotonic stomach has a widened stomach sac and ascending limb, whilst the descending portion is lengthened and narrowed, the









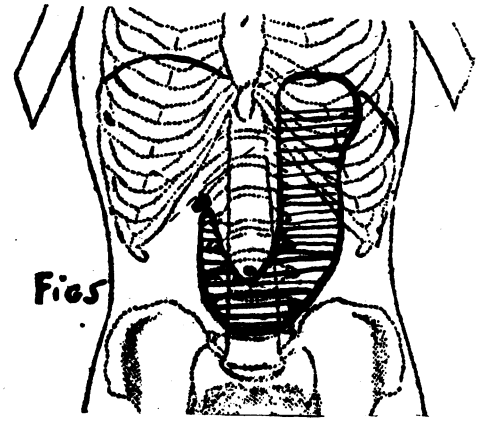


Figure 1—The normal stomach—a, magenblase; b, descending part; c, stomach sac; d, antrum of stomach; e, duodenum; f, stomach angle; g, pyloric ring.

Figure 2—The continuous line represents the outline of the bismuth-meal containing normal stomach. The dotted line, the outline after a double test meal.

Figure 3—The normal stomach with the patient lying down. Note its shape and the absence of a magenblase.

Figure 4—Atonic pseudo-hourglass stomach. Continuous line represents outline after bismuth test meal. Dotted line outline after double test meal.

Figure 5—Gastroptosis. Pylorus in position. Normal tonicity.

bismuth content, however, rising above the narrowed portion. The upper limit of the shadow is flat, the stomach bubble somewhat rectangular in shape. It empties in from four to six hours.

The shadow of the atonic stomach has its stomach sac and ascending limb still further widened, whilst the descending portion is still more thinned and narrowed. The shadow of the bismuth meal does not extend up beyond the narrowed area, and the stomach bubble is funnel-shaped. Such a stomach empties in about six hours. A double bismuth meal leads only to a widening of the shadow as described, and not to any marked additional height of the bismuth shadow.

The peristaltic and peristolic functions of the gastric muscle are independent of each other just as the similar properties of the heart muscle are.

Gastroptosis. In gastroptosis both limbs of the gastric shadow are lengthened and narrowed whilst the pylorus is normally situated. The lesser curvature is much too low, perhaps below the normal position of the navel. With this the peristolic function or gastric tonus is well maintained, perhaps even excessive, for the bismuth shadow extends abnormally high in the descending limb, and the stomach bubble is small and round. Groedel suggests that this gastroptopic stomach is really primarily due to a descent of the transverse colon which instead of serving as a gastric cushion now adds to the stomach load.

On the other hand most stomachs with diminished tonus exhibit some degree of gastroptosis, and the loss of tonus in its turn may occur in gastroptosed organs.

Pyloroptosis. In pyloroptosis there is some degree of dropping of the pylorus, and the descending part of the stomach is elongated and narrowed. This may be only part of a general enteroptosis, on the other hand the liver may have maintained its normal position, the dropped pylorus then indicating a lax gastro-hepatic omentum.

Even with a considerable pyloroptosis if the radiogram has been made with the patient prone the pylorus might appear to be normally situated. Such a postural change in the position of the pylorus is characteristic of pyloroptosis, and shows that no adhesions are present fixing the pylorus in its abnormal position. A similar change in the position of the pylorus occurs when the abdomen is voluntarily drawn in or pushed in by the examiner.

The tonus of the pyloroptotic stomach may be high, normal or low, leading to the associated characteristic variations in the fiilling of the descending limb, in the size of the stomach bubble, and in the emptying time of the stomach. Groedel believes that pyloroptosis may sometimes result from diminished support to and increased weighting of the stomach, it representing a later stage of gastroptosis.

Abnormalities of secretion. Hypersecretion according to Schlesinger is suggested by an increased breadth of the intermediate zone of the gastric shadow.

Achylia leads to insufficiency of the pylorus, so that the emptying time of the stomach is considerably reduced, the bismuth meal all leaving the stomach in two hours or less.

In neurasthenics and hysterics who complain of gastric symptoms due to functional disturbances, the radiological examination commonly shows no departure from the normal; sometimes however in young people there is an associated hypertonicity and hypermotility. The shadow is then horn shaped, the antrim is smaller than usual and the emptying time somewhat hastened.

The diseases of other systems (tabes, Addison's disease, phthisis, brain tumor) which present in their course gastric symptoms are associated with a radiologically normal stomach, a finding which is of considerable aid in correctly interpreting the sometimes puzzling picture.

Pathological lesions in the neighborhood of the stomach, but of non-gastric origin, sometimes imitate gastric diseases. A tumor may be readily palpable, and be clinically apparently of gastric origin, but radiology may show that the tumor is outside the area of the stomach shadow, or becomes outside when the abdomen is retracted. If it indents the stomach shadow the indentation is smooth and clean cut. Splenic tumors displace to the right the cardiac end of the stomach. Left renal tumors similarly displace the stomach sac and antrum.

A painful and tender area may be present in the upper abdomen and be associated with some muscular rigidity; radiology will show whether or not this point lies within the area of the stomach, a very helpful point in diagnostic work.

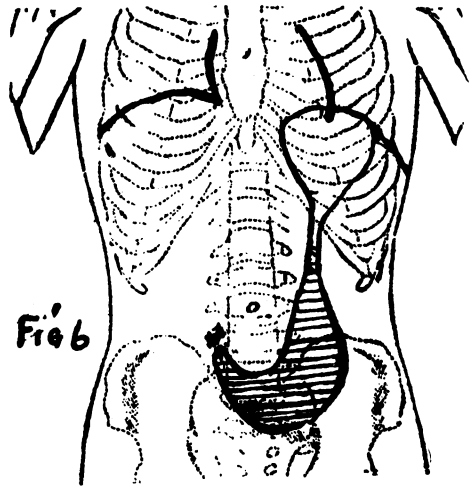
Gall bladder and appendix dyspepsia unassociated with gastric changes show radiologically either no departure from the normal or a hypertonic form of stomach shadow. The sensitive point is extra ventricular.

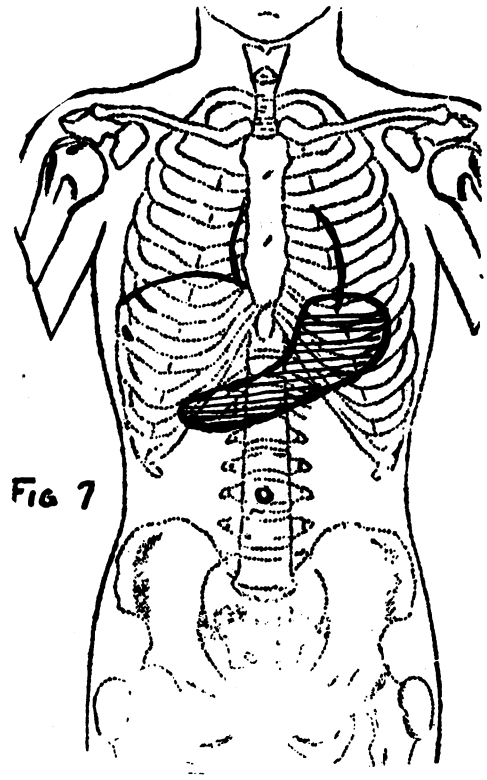
Pericolycystitis not infrequently leads to adhesions which drag upon the pylorus and fix it up under the right rib border. The stomach shadow is high, runs diagonally across the upper abdomen, is shaped like a steer's horn, and has little mobility. Such a finding speaks for gallbladder disease.

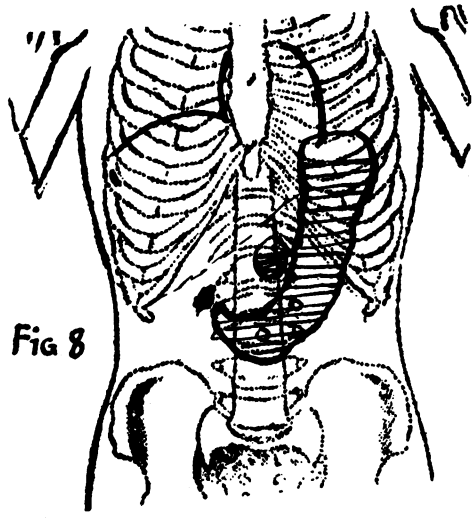
Other perigastric adhesions lead to distortion and fixation of the stomach shadow, tooth-like projections of the shadow occurring at the adherent area.

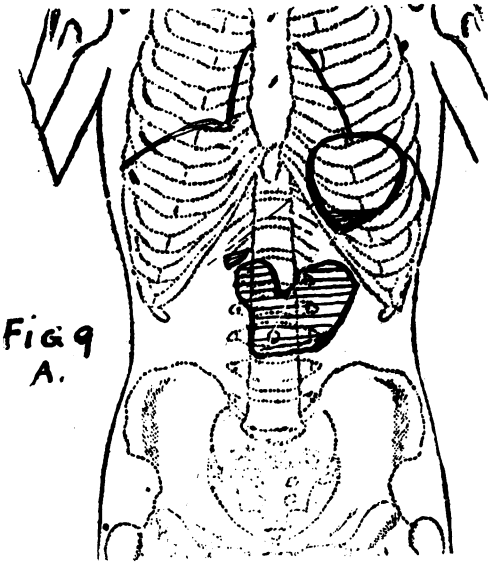
ORGANIC DISEASES OF THE STOMACH WALLS.

A flat ulcer of the stomach gives rise to no abnormality of the stomach shadow, but associated with every active ulcer wherever situated is an accompanying pyloric spasm. This pyloric spasm interferes with the emptying time of the stomach, prolonging it to six hours or more. This prolongation of the emptying time, readily recognizable by the X-Ray is of great diagnostic aid, and is so uniform that it is one of the most valuable of all diagnostic points in considering whether a gastric ulcer is or is not present, and in determining whether an ulcer known to have been present has or has not healed. The tender point









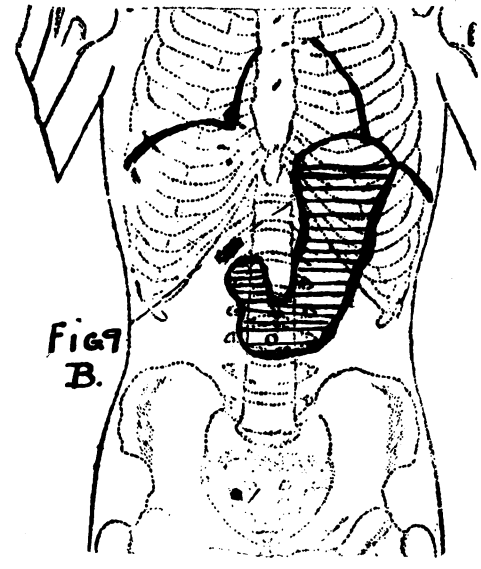


Figure 6—Pyloroptotic atonic pseudo-hourglass stomach.
Figure 7—Pylorus dragged up under the right rib border by pericholycystitic adhesions.
Figure 8—Penetrating ulcer of the lesser curvature.
Figure 9—Two radiograms of the same stomach at different times—a, showing hourglass stomach temporary and therefore due to spasm.

present is found to be within the stomach shadow, it as a rule corresponding to the site of the ulcer.

Duodenal ulcers lead to a hypertonic form of stomach shadow. The organ empties within the normal time, the tender point is over the duodenum. As long as a duodenal ulcer is associated with this form of stomach the chances of its healing under medical treatment are extremely good, but if dilatation be present, or the emptying time be prolonged much time will be saved if the patient be referred to the surgeon for gastro-enterostomy.

Chronic penetrating ulcers of the stomach are of not uncommon occurrence. The picture they present is striking and characteristic. Outside the normal stomach shadow, apart from but in close proximity to it, and usually on the side of the lesser curvature, is an additional bismuth shadow. This bismuth shadow has an air bubble capping it, it thus being a miniature of the gastric shadow. It is due to a part of the bismuth meal having found its way through the stomach wall into the ulcerated cavity in the neighborhood. In this cavity remnants of food may stagnate for some time, lactic acid be produced, and thus the stomach contents after a test meal may show both hydrochloric and lactic acid. Such a radiographic picture always means a penetrating ulcer, which may or may not have undergone malignant degeneration. Such a picture may not be present in an antero-posterior exposure though an oblique view might at once demonstrate it, the stomach and cavity shadows thus being separated.

A chronic ulcer may lead to an hour-glass type of stomach, a condition readily radiologically demonstrable though clinically very difficult of diagnosis. This hour-glass condition of stomach is sometimes diagnosed, however, by the radiographer when it does not exist. The following hour-glass and pseudo hour-glass stomach shadows are recognizable:

1. The atonic hour-glass stomach. The failure of the bismuth meal to collect in any amount above the narrowed pulled out portion of the descending limb, and the other characteristics we have described should be sufficient to prevent error.

2. A segment of distended bowel of an extra ventricular tumor may indent the greater curvature of the stomach leading to a pseudo hour-glass effect. The line of the lesser curvature is continuous in such cases, the distended bowel is visible, the tumor if present is palpable. We have had no difficulty in preventing confusion.

3. A spasm of a part of the descending limb of the stomach may be present perhaps associated with an ulcer. A portion of the meal may collect in the stomach sac, a portion above the spasm which may be of some extent. Spasms are temporary, organic changes are constant. Radiograms in different postures and at different times show different results, and the diagnosis becomes apparent.

4. The organic hour-glass stomach associated with an ulcer shows as a rule a transverse constriction. The connecting line of bismuth as a rule does not arise from the most caudal point of the upper bismuth shadow, and is located near the lesser curvature. Change in posture does not change the shape of the shadow. There is an associated delay in the emptying of the lower compartment due to an accompanying dependent pyloric spasm.

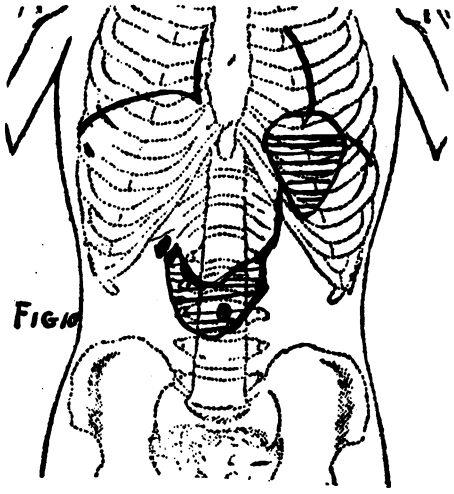
5. An hour-glass stomach may result from carcinoma, the growth surrounding the midportion of the stomach. The constriction is of greater extent and more irregular in outline. There is no delay in emptying the lower compartment, but rather a hastening owing to the accompanying achylia.

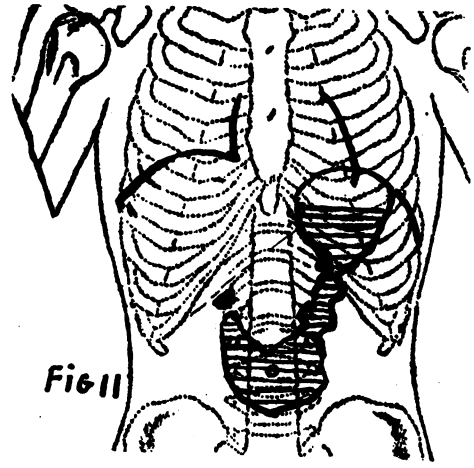
A chronic ulcer on the lesser curvature pulls the pylorus upwards and to the left so that the ascending portion of the greater curvature extends further to the right than does the pylorus itself. The so-called snail-like form of shadow is thus produced. There is of course delay in emptying due to the accompanying pyloric spasm, and the residue is displaced to the left.

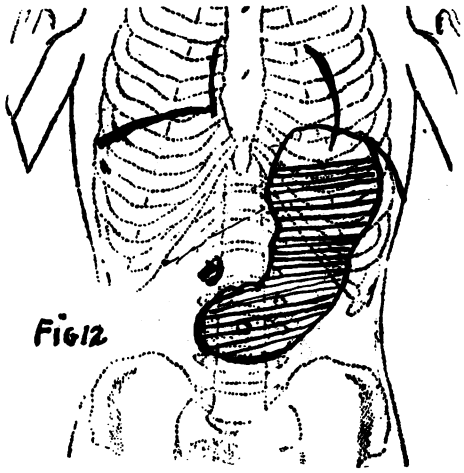
An ulcer of the pylorus may lead to stenosis with gastric dilatation and consequent marked delay in emptying. The radiographic diagnosis of dilatation of the stomach is difficult as long as the stomach wall retains its tone, but when atonicity is added to dilatation there is a striking descrepancy between the amount of food taken and the size of the shadow. The bismuth meal lies mainly in the stomach sac, and does not reach far up the descending or the ascending limbs. The lower border is convex, the upper border flat, a half-moon effect thus being produced. The shadow lies much further to the right than normal. If a double or triple meal be taken it may still be impossible to fill the ascending limb, and to obtain a radiographic shadow of this area it may be necessary to have the patient lie on the right side. The delay in emptying is quite marked and the shadow remaining at the end of four hours presents regular edges. The absence of a tender point over the pylorus suggests a scar rather than an active ulcer. Such a picture may occasionally be found and the obstruction be malignant in type. The pyloric edge of the residue is in such cases irregular and toothed, or a marked shadow defect may be present.

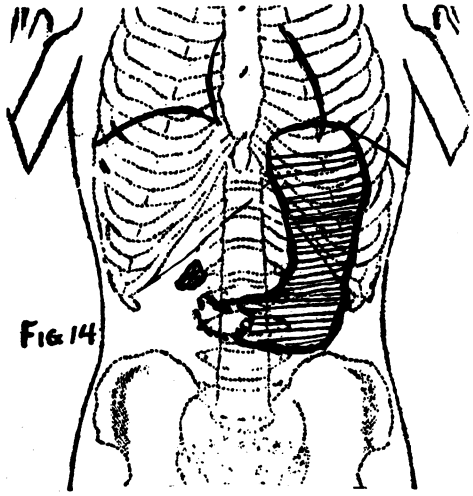
A similar discrepancy between the amount of food taken and the size of the shadow may occur in an atonic dilated stomach, in which the dilatation has secondarily followed the lack of tone, and is not dependent upon organic obstruction. The emptying time, however, is not nearly so much delayed, and the sickle-shaped residue is not displaced to the right. The occurrence of anti-peristaltic waves denotes the presence of an obstruction.

Carcinoma of the stomach leads to a growth which projects into the cavity of the stomach, thus taking up space which is normally occupied by a portion of the bismuth meal. As a result there is an absence of the dense shadow in the region of the tumor, and owing to the irregularity of the growth the outline of the defect is irregular or toothed. Such areas of shadow absence are









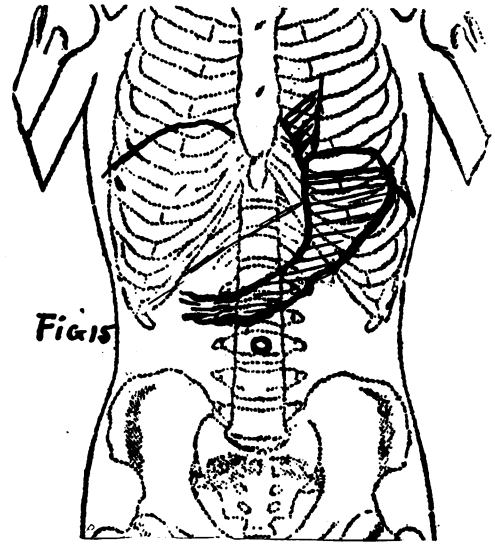


Figure 10—Hourglass stomach due to ulcer. Note the caudal point of the upper compartment is below the level of the beginning of the connecting band, the latter being situated near the line of the lesser curvature. The lower compartment empties slowly owing to an accompanying pyloric spasm.

Figure 11—Hourglass stomach due to carcinoma of the descending portion. Note the irregular margins of the connecting bar. Owing to the achylia the lower compartment will empty rapidly. Inoperable.

Figure 12—Note the ascending portion of the greater curvature turns upwards and inwards toward the pylorus producing the so-called snail type of shadow. Ulcer of the lesser curvature.

Figure 13—Residue after obstruction—a, from scar tissue; b, from presence of a carcinoma.

Figure 14—Carcinoma of the pylorus. Achylia. Delay in emptying. Defect in shadow at antrum. General shape of stomach shadow maintained. Operable.

Figure 15—Late shape of a scirrhus carcinoma. Note the contracted deformed shadow, the absence of the pyloric ring and the stagnation in the oesophagus. Inoperable.

highly characteristic of the presence of carcinomata in contradistinction to areas of shadow extension which are characteristic of penetrating ulcers. If a tumor be palpable and be clinically of gastric origin, and be seen radiologically to move with the stomach shadow, and no area of shadow defect be present, the tumor is probably non-malignant in type, since such tumors are commonly comparatively flat, whilst malignant tumors project into the stomach lumen. Further carcinomata lead to achylia and consequently there is no delay in emptying, but often a hastening unless the growth block the pylorus, and even then the resulting dilatation and delay in emptying is not nearly so marked as it is with stenosis due to a simple ulcer.

Three common types of gastric carcinomata are met with clinically.

1. The gastric carcinoma which develops on the basis of a simple ulcer.
2. The fungous carcinoma.
3. The diffuse infiltrating carcinoma.

Each of these varieties radiologically present differences which often render their recognition comparatively easy. With the first variety added to a shadow suggesting the presence of an ulcer there is an irregularly contoured area of shadow absence in the neighborhood which could only be due to the presence of a tumor projecting into the stomach lumen. Even if no such shadow defect be visible, the presence of hypermotility, and an emptying time within the normal will suggest that the ulcer had become malignant in character.

2. The fungous carcinoma leads to an irregularly contoured area of shadow absence in a stomach otherwise of normal form. The emptying time is within the normal unless the tumor actually block the pylorus, and achylia plus delay in emptying without shadow defect means a small pyloric growth, with shadow defect a large growth.

3. The diffuse infiltrating type of carcinoma narrows the whole pars pylorica or media. In the first case the function of the pyloric sphincter may be destroyed, and a continuous band of bismuth shadow reaches from stomach to duodenum. If the growth infiltrates the descending limb of the stomach the carcinomatous hour-glass type of stomach develops. The radiological characters of this has already been described. Dilatation of the proximal or cardiac end of the stomach then ensues, and finally the cardiac sphincter ceases to functionate, and food collects in the cardiac portion of the stomach and in the oesophagus itself, whilst that portion that passes through the hour glass constriction quickly empties into the duodenum.

Perhaps the greatest of all services which the Roentgen ray is frequently able to render the clinician in the consideration of gastric carcinomata is to tell him what cases are operable and what cases are not, and in many cases to suggest the character of the required operation. The fungous carcinomata that merely lead to a circumscribed loss of shadow, but to no general shadow distortion can be operated upon with fair hope of success provided no metastatic growths have occurred. The infiltrating form of carcinoma that has led to a distortion of stomach shadow presents an inoperable condition, and there is no reason for performing a gastro-enterostomy since there is no pyloric obstruction.

One warning is perhaps necessary. In the erect posture the fundus of the empty stomach is occupied by air, the remainder of the organ existing as a tube whose position roughly corresponds to that occupied by the lesser curvature. If the patient lies down the air is more uniformly distributed so that the stomach has more or less the shape of a steer's horn. This is the shape of the empty dead stomach. The loaded working stomach of a man in his working posture presents quite a different appearance and the surgeon who does not keep abreast of modern teaching will find so much discrepancy between the radiological picture of the active stomach of the standing man, and the appearance presented at operation by the empty inactive stomach of his prone patient, that he will be tempted to conclude unwisely that radiological investigation of the stomach has little merit. It is a pleasure to be able to refer him to the work of Schnieden and Courmont, who now rarely perform unnecessary, useless exploratory laparotomies, they deriving from a preliminary intelligent radiological study much of the information which they could only previously acquire after opening the abdomen.

The radiological investigation of the stomach is no longer then a matter of mere academic interest, but it is an essential element in the routine study of every grave case, and in many instances it is the procedure which physician and patient can least afford to leave undone.

Discussion.

Dr. J. H. Barbat, San Francisco: Dr. Cooper has left very little to be said on this subject. I simply want to reiterate what has been said. I have been doing some of this work and certainly have been pleased to find that radiology of the stomach has demonstrated very definitely that the most expert diagnosticians are not able by any other means to determine in a large number of cases either the position or the motility of stomachs as definitely as can be done by radiology. I have been using the flouroscope. The peristaltic wave can be seen distinctly, the tonicity of the stomach can be determined and we are astonished to find that even in cases diagnosed as ptosis of the stomach with retention the X-ray will often demonstrate the incorrectness of the diagnosis by revealing the exact shape and size of the organ and the time required to empty it. In these cases we must find some other cause if the symptoms persist and I feel that no surgeon should operate on any stomach case without a diagnosis confirmed by the X-ray.

Dr. W. W. Kerr, San Francisco: I have been talking with Dr. Cooper about these cases, first as to what we would judge to be a dilated stomach. A great deal of discussion has taken place frequently in going over stomachs because in the patients we found the greater curvature of the stomach below the umbilicus—that is when the stomach is distended it is in its normal field. In more than one such case I have seen operation urged because it was thought that the stomach was dilated. Dr. Cooper has brought forward the fact that the normal curvature of the stomach is one to two inches below the umbilicus. Again, when

the patient is in the prone position, of course it is above the umbilicus. That change of position therefore when we have to work without the radiogram enables us to come to some idea as to whether we are really dealing with a dilated stomach or a simple distension. The next point was in regard to the different causes that might lead to dilatation, the point upon which the doctor touched in regard to the atonic condition of the stomach muscle. I think there is no question that the stomach muscle possesses quite a number of functions very much as we have in the cardiac muscle. In many conditions we have secondary conditions giving rise to immense dilatation of the stomach which if it were treated surgically would be extremely unfortunate. In one case, a woman about 40 years of age, there was an immense fibroid existing for many years. She would be attacked at intervals with vomiting even if all food was withheld—sometimes two to three basinsful—a distinct gastric succorhea, with stomach distended down below the line of the iliac spines. In the course of treatment we washed out the stomach and it would soon contract again and be perfectly normal in outline and the patient would take a normal amount of food. I saw that occur with her at intervals of once in four weeks and then she would go along for several months. One cannot help associating such a change in the stomach with the same kind of thing we find in the cardiac muscle. The uterine fibroid in many cases seems to produce a toxin interfering with the muscle of the heart and when the fibroid is removed the patient will have a perfectly healthy heart in the course of a very short time. It is of importance to bear in mind that under similar conditions we can have a loss of tonicity leading to gastric dilatation that might tempt us to recommend gastroenterostomy and where repeated investigations would often save the patient and the surgical reputation.

Dr. R. S. Levenson, Los Angeles: It has been a great privilege to listen to this paper. It is very significant that in many of the important conclusions to which he comes as the result of the radiograms he comes to the same conclusions that I mentioned in my paper as the result of analysis and the use of the tube, especially with regard to the significance of achylia with delayed emptying. Dr. Cooper called especial attention to that as the case in carcinoma of the pylorus. In one point I take issue and that is in regard to my use of the tube. There are differences which occur and conclusions one comes to—that is with regard to the motility in duodenal ulcer. He found usually hypermobility. I usually find pyloric spasm with delayed emptying. I recall an article by a German in which he mentioned the collection of hypersecretion dependent upon the different methods used.

Dr. C. M. Cooper, San Francisco: Regarding the point made by Dr. Levenson it depends upon the stage in which you get the duodenal ulcer. Early the hypermotility more than compensates for the pyloric spasm. Later the pyloric spasm is predominant and there is delayed emptying.

THE DIAGNOSIS OF LATENT GONORRHEA IN THE FEMALE.*

By WALTER S. JOHNSON, M. D., San Francisco.

Recognizing the difficulty of presenting anything new on this subject, my principal aim is to promote a discussion upon this obscure condition. Therefore, I will confine myself to the diagnosis of a disease which presents only probable or uncertain signs. My investigations were stimulated by the following case:

Mrs. L. consulted me in October, 1904, informing me that she had been accused by her husband to whom she had been married only two months, of infecting him with gonorrhea. She denied having any symptoms or any discomfort and wished me to make a thorough examination. A careful history of previous illness or complaints of any kind was negative, except for diseases of childhood. A most careful examination was made for any evidence of clinical signs and with exception of erosion of the cervix, these were practically nil. Smears were taken from the urethra and cervix and subjected to a definite amount of study. Failing to find the characteristic diplococci, I gave her a clean bill of health. Several weeks elapsed and I was served as a witness in a suit for divorce. Upon my testimony, the woman was granted her prayer before the courts. One year later, Mrs. L. again consulted me. This time her mannerisms were less defiant and her feelings were less injured. She was afraid she might have infected her friend and solicited re-examination. The clinical and bacterioscopic examinations were negative as before. At her suggestion her friend came to me for examination. He received treatment for an undoubted gonorrhea. He vigorously denied having had sexual congress with anyone but the woman in question for a very long period and this was his first infection. He acknowledged having had coitus during and immediatelv after menses, and attributed his infection to this cause. An examination was made immediately after her next period and a number of gram negative diplococci were found. She then admitted having had an attack of some inflammatory disease of her womb which confined her to bed for a month eight years previously.

That the diagnosis of latent gonorrhea in the female possesses the utmost difficulties, is admitted by all authorities on the subject. The clinical evidence of gonorrhea is based on the presence of changes in the tissues, yet these changes are by no means pathognomonic, as they may be produced by other microorganisms or irritants.

The bacterioscopic method of diagnosis, because of its limitations, is also uncertain. Notwithstanding these difficulties, with proper study of the clinical and bacteriological evidence, we can make a diagnosis in the greater number of our cases.

The urologist and those who treat genito-urinary diseases are often called upon to diagnose cases brought for confrontation. In fact, it is not uncommon to have a female come most voluntarily for an examination upon the request of one who feels that she carries the source of his infection. She apparently is in the best of health and does not experience any discomfort. Upon examination such women present no trace of virulent disease, but have some of the probable or uncertain signs thereof.

The indefinite persistency of the infection in the latent or chronic stages may be better understood by a careful consideration of the organs usually affected and the tissue changes which may be produced by a gonorrheal infection.

In old urethritis the subjective symptoms are commonly absent. The objective signs are a milky discharge and a periurethral infiltration; the meatus is everted usually exposing one or both of the glandular orifices, which normally lie concealed just within the external meatus. There are often small

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